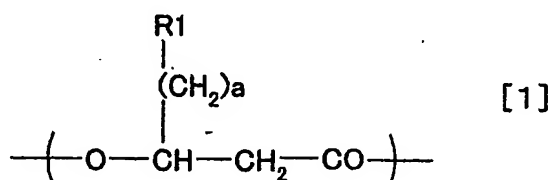
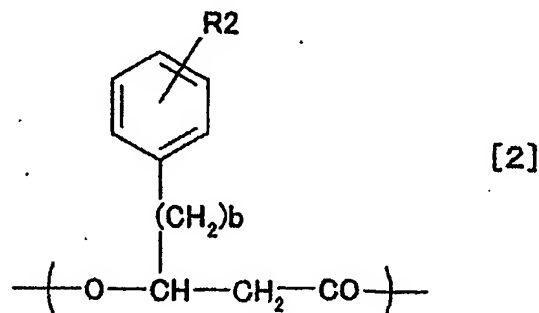


## CLAIMS

1. A structure comprising a base material characterized in that the base material is coated at  
 5 least partly with a polyhydroxyalkanoate containing at least one monomer unit selected from the group consisting of those represented by one of the chemical formulae [1] to [8]:



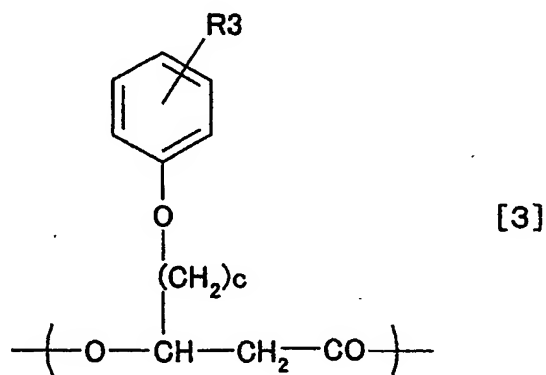
- 10 (wherein, the monomer unit is at least one selected from the group consisting of monomer units in which a combination of R1 and "a" is any one of combinations, wherein R1 is vinyl group; and "a" is an integer of 1 to 10),



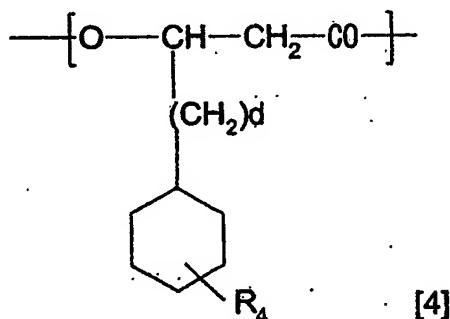
15

- (wherein, "b" is an integer of 1 to 8; and R2 is one selected from the group consisting of CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>,

vinyl and epoxy groups, and COOR<sub>21</sub> (R<sub>21</sub> is H, Na or K atom), which are independently applicable to each unit when there are 2 or more units),



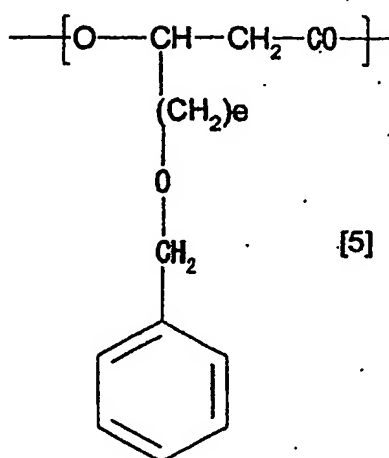
- 5 (wherein, "c" is an integer of 1 to 8; and R<sub>3</sub> is one selected from the group consisting of CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub> and SCH<sub>3</sub> groups, which are independently applicable to each unit when there are 2 or more units),



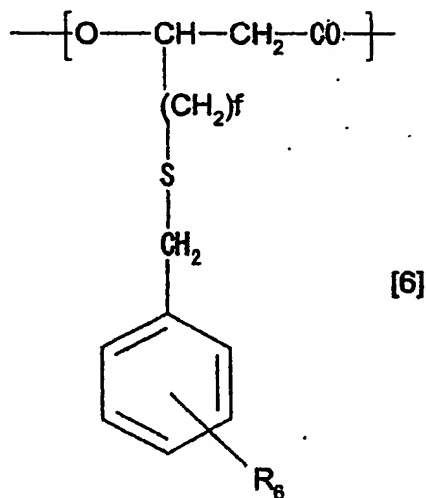
- 10 (wherein, "d" is an integer of 0 to 8; and R<sub>4</sub> is selected from the group consisting of H and a halogen atoms, and CN, NO<sub>2</sub>, CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>, CF<sub>3</sub>, C<sub>2</sub>F<sub>5</sub> and C<sub>3</sub>F<sub>7</sub> groups when "d" is 0, and selected from the group consisting of CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub> and C<sub>3</sub>H<sub>7</sub> groups when "d" is 1

121

to 8, which are independently applicable to each unit when there are 2 or more units),



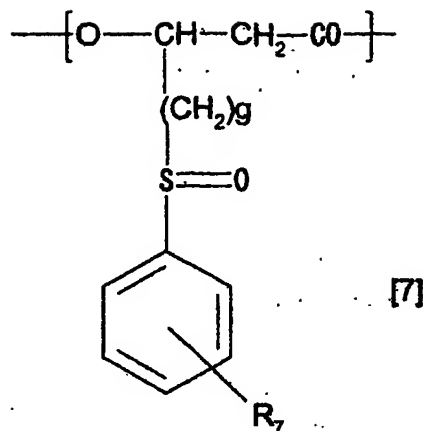
(wherein, "e" is an integer of 1 to 8),



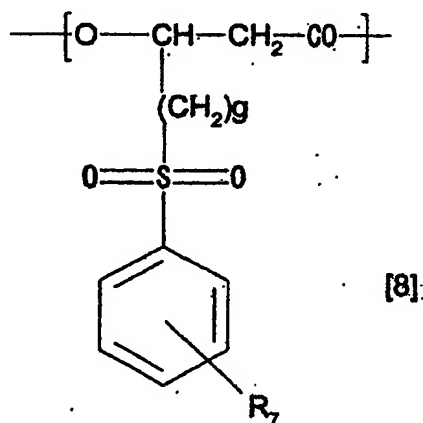
5

(wherein, "f" is an integer of 1 to 8; and R<sub>6</sub> is one selected from the group consisting of CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>, (CH<sub>3</sub>)<sub>2</sub>-CH and (CH<sub>3</sub>)<sub>3</sub>-C group, which are independently applicable to each unit when there are 2 or more

10 units),



(wherein, "g" is an integer of 1 to 8; and R<sub>7</sub> is a H or halogen atom, or CN, NO<sub>2</sub>, COOR<sub>71</sub> (R<sub>71</sub> is H, Na, K, CH<sub>3</sub> or C<sub>2</sub>H<sub>5</sub>), SO<sub>2</sub>R<sub>72</sub> (R<sub>72</sub> is OH, ONa, OK, a halogen atom, OCH<sub>3</sub> or OC<sub>2</sub>H<sub>5</sub>), CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>, (CH<sub>3</sub>)<sub>2</sub>-CH or (CH<sub>3</sub>)<sub>3</sub>-C group, which are independently applicable to each unit when there are 2 or more units), and



(wherein, "g" is an integer of 1 to 8; and R<sub>7</sub> is H or a halogen atom, or CN, NO<sub>2</sub>, COOR<sub>71</sub> (R<sub>71</sub> is H, Na, K, CH<sub>3</sub> or C<sub>2</sub>H<sub>5</sub>), SO<sub>2</sub>R<sub>72</sub> (R<sub>72</sub> is OH, ONa, OK, a halogen

atom,  $\text{OCH}_3$  or  $\text{OC}_2\text{H}_5$ ),  $\text{CH}_3$ ,  $\text{C}_2\text{H}_5$ ,  $\text{C}_3\text{H}_7$ ,  $(\text{CH}_3)_2\text{-CH}$  or  $(\text{CH}_3)_3\text{-C}$  group, which are independently applicable to each unit when there are 2 or more units).

2. The structure according to claim 1, wherein  
5 the polyhydroxyalkanoate is chemically modified at least partly.

3. The structure according to claim 2, wherein the chemically modified polyhydroxyalkanoate has at least a graft chain.

10 4. The structure according to claim 3, wherein the graft chain is chemically modified with a polyhydroxyalkanoate which contains a monomer unit having at least one selected from the group consisting of a halogen atom, and vinyl, epoxy and  
15 carboxyl groups.

5. The structure according to claim 3, wherein the graft chain is of a compound which has at least one selected from the group consisting of thiol, hydroxyl and amino groups.

20 6. The structure according to claim 2, wherein the polyhydroxyalkanoate is crosslinked at least partly.

7. The structure according to claim 6, wherein the crosslinked polyhydroxyalkanoate contains a  
25 monomer unit having one selected from the group consisting of vinyl and epoxy group.

8. The structure according to claim 1, wherein

the base material is particulate.

9. The structure according to claim 8, wherein the base material contains a colorant.

10. A toner which contains the structure.  
5 according to claim 8.

11. The structure according to claim 1, wherein the base material is in the form of flat plate or film.

12. The structure according to claim 1, wherein  
10 the monomer unit composition in the polyhydroxyalkanoate varies from the structure inside towards the outside of the structure.

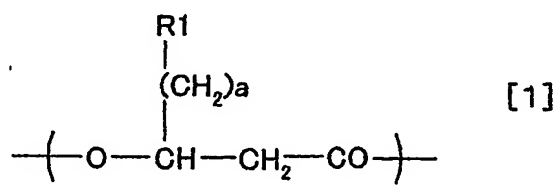
13. The structure according to claim 1, wherein the base material carries a polyhydroxyalkanoate  
15 synthetase immobilized thereon.

14. A method for forming an image by supplying the toner according to claim 10 onto a recording medium.

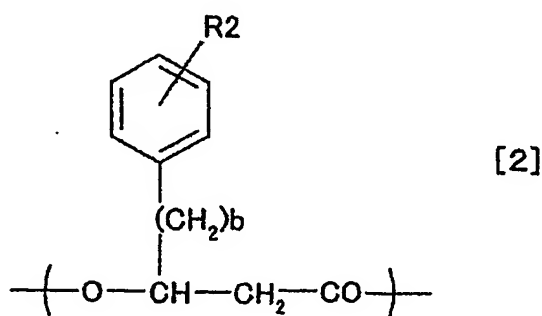
15. A device for forming an image by supplying  
20 the toner according to claim 10 onto a recording medium.

16. A method for producing a structure having a base material coated with a polyhydroxyalkanoate at least partly, comprising the steps of immobilizing an  
25 polyhydroxyalkanoate synthetase on the surface of the base material; and polymerizing a 3-hydroxyacyl coenzyme A selected from the group consisting of

those represented by one of the chemical formulae [9] to [15] with the aid of the polyhydroxyalkanoate synthetase to synthesize the polyhydroxyalkanoate comprised of a monomer unit selected from the group consisting of those represented by one of the chemical formulae [1] to [8]:

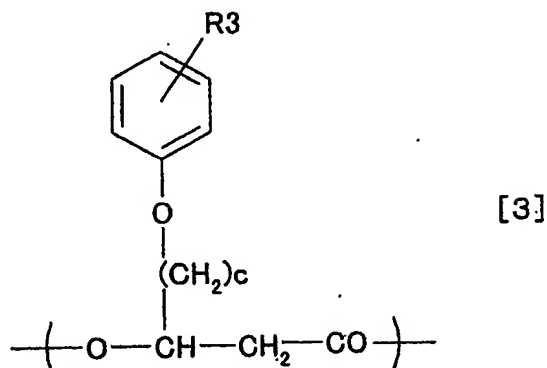


(wherein, the monomer unit is at least one selected from the group consisting of monomer units in which a combination of R1 and "a" is any one of combinations, wherein R1 is vinyl group; and "a" is an integer of 1 to 10),

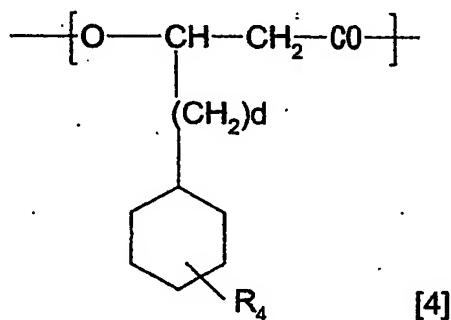


(wherein, "b" is an integer of 1 to 8; and R2 is one selected from the group consisting of CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>, vinyl and epoxy groups, and COOR<sub>21</sub> (R<sub>21</sub> is H, Na or K atom), which are independently applicable to each

unit when there are 2 or more units),



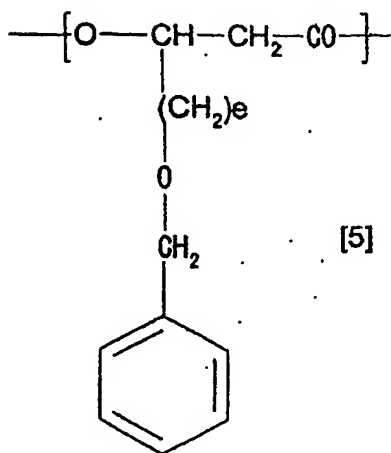
(wherein, "c" is an integer of 1 to 8; and R3 is one selected from the group consisting of CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub> or SCH<sub>3</sub> groups, which are independently applicable to each unit when there are 2 or more units),



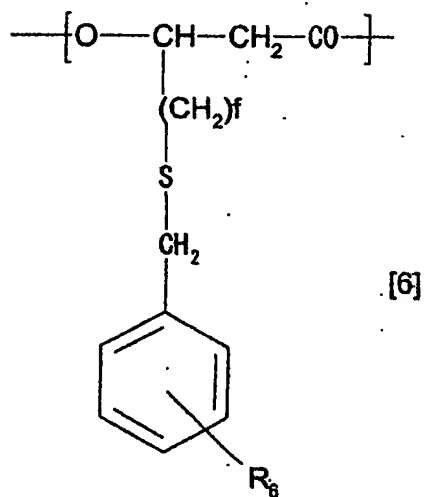
(wherein, "d" is an integer of 0 to 8; and R4 is selected from the group consisting of H and halogen atoms, and CN, NO<sub>2</sub>, CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>, CF<sub>3</sub>, C<sub>2</sub>F<sub>5</sub> and C<sub>3</sub>F<sub>7</sub> groups when "d" is 0, and selected from the group consisting of CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub> and C<sub>3</sub>H<sub>7</sub> groups when "d" is 1 to 8, which are independently applicable to each unit when there are 2 or more units),



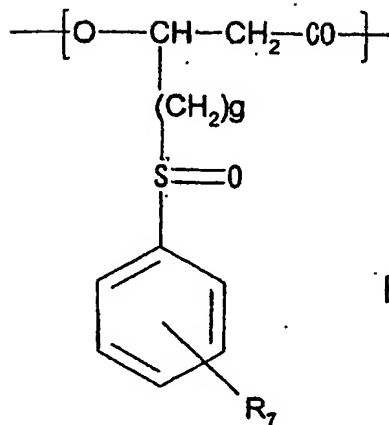
127



(wherein, "e" is an integer of 1 to 8),

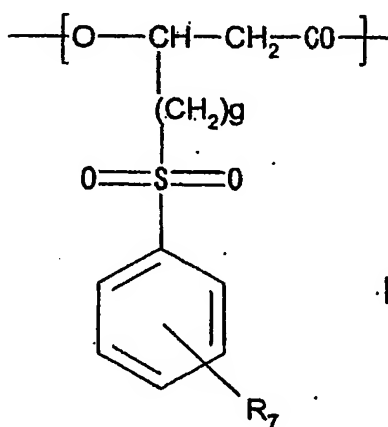


(wherein, "f" is an integer of 1 to 8; and R<sub>6</sub> is one  
 5 selected from the group consisting of CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>,  
 (CH<sub>3</sub>)<sub>2</sub>-CH and (CH<sub>3</sub>)<sub>3</sub>-C groups, which are independently  
 applicable to each unit when there are 2 or more  
 units),



[7]

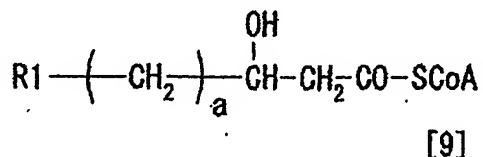
(wherein, "g" is an integer of 1 to 8; and R<sub>7</sub> is H or halogen atom, or CN, NO<sub>2</sub>, COOR<sub>71</sub> (R<sub>71</sub> is H, Na, K, CH<sub>3</sub> or C<sub>2</sub>H<sub>5</sub>), SO<sub>2</sub>R<sub>72</sub> (R<sub>72</sub> is OH, ONa, OK, halogen atom, OCH<sub>3</sub> or OC<sub>2</sub>H<sub>5</sub>), CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>, (CH<sub>3</sub>)<sub>2</sub>-CH or (CH<sub>3</sub>)<sub>3</sub>-C group, which are independently applicable to each unit when there are 2 or more units),



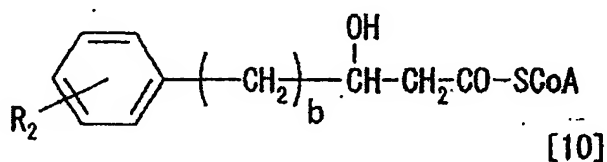
[8]

(wherein, "g" is an integer of 1 to 8; and R<sub>7</sub> is H or halogen atom, or CN, NO<sub>2</sub>, COOR<sub>71</sub> (R<sub>71</sub> is H, Na, K, CH<sub>3</sub> or C<sub>2</sub>H<sub>5</sub>), SO<sub>2</sub>R<sub>72</sub> (R<sub>72</sub> is OH, ONa, OK, halogen atom,

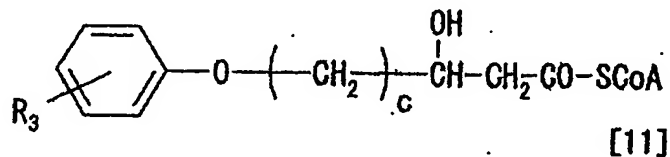
OCH<sub>3</sub> or OC<sub>2</sub>H<sub>5</sub>), CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>, (CH<sub>3</sub>)<sub>2</sub>-CH or (CH<sub>3</sub>)<sub>3</sub>-C group, which are independently applicable to each unit when there are 2 or more units),



- 5 (wherein, -SCoA is a coenzyme A bound to an alkanolic acid; "a" is an integer of 1 to 10, corresponding to "a" in the monomer unit represented by the formula [1]; and R<sub>1</sub> is vinyl group),

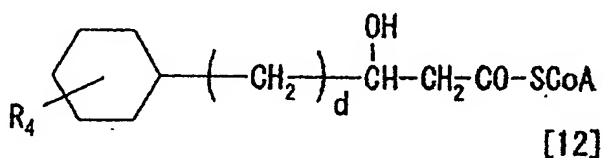


- 10 (wherein, -SCoA is a coenzyme A bound to an alkanolic acid; "b" is an integer of 1 to 8, corresponding to "b" in the monomer unit represented by the formula [2]; and R<sub>2</sub> is one selected from the group consisting of CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub> and vinyl groups, corresponding to
- 15 R<sub>2</sub> in the monomer unit represented by the formula [2],



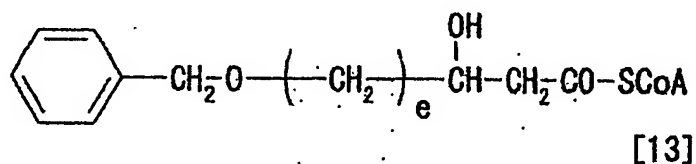
(wherein, -SCoA is a coenzyme A bound to an alkanolic acid; "c" is an integer of 1 to 8, corresponding to

"c" in the monomer unit represented by the formula [3]; and R3 is one selected from the group consisting of CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub> and SCH<sub>3</sub> groups, corresponding to R3 in the monomer unit represented by the formula [3],



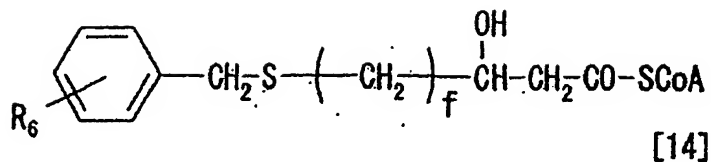
5

(wherein, -SCoA is a coenzyme A bound to an alkanolic acid; "d" is an integer of 0 to 8, corresponding to "d" in the monomer unit represented by the formula [4]; and R4 is from the group consisting of H and  
 10 halogen atoms, and CN, NO<sub>2</sub>, CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>, CF<sub>3</sub>, C<sub>2</sub>F<sub>5</sub> and C<sub>3</sub>F<sub>7</sub> groups when "d" is 0, and one selected from the group consisting of CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub> and C<sub>3</sub>H<sub>7</sub> groups when "d" is 1 to 8, corresponding to R4 in the monomer unit represented by the formula [4],

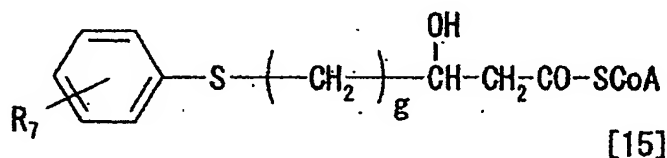


15

(wherein, -SCoA is a coenzyme A bound to an alkanolic acid; "e" is an integer of 1 to 8, corresponding to "e" in the monomer unit represented by the formula [5],



(wherein, -SCoA is a coenzyme A bound to an alkanolic acid; "f" is an integer of 1 to 8, corresponding to "f" in the monomer unit represented by the formula [6]; and R<sub>6</sub> is one selected from the group consisting of CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>, (CH<sub>3</sub>)<sub>2</sub>-CH and (CH<sub>3</sub>)<sub>3</sub>-C group, corresponding to R<sub>6</sub> in the monomer unit represented by the formula [6], and



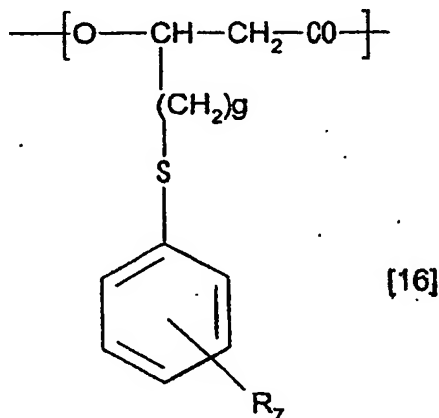
(wherein, -SCoA is a coenzyme A bound to an alkanolic acid; "g" is an integer of 1 to 8, corresponding to "g" in the monomer unit represented by one of the formulae [7] and [8]; and R<sub>7</sub> is one selected from the group consisting of H and halogen atoms, and CN, NO<sub>2</sub>, COOR<sub>71</sub> (R<sub>71</sub> is H, Na, K, CH<sub>3</sub> or C<sub>2</sub>H<sub>5</sub>), SO<sub>2</sub>R<sub>72</sub> (R<sub>72</sub> is OH, ONa, OK, a halogen atom, OCH<sub>3</sub> or OC<sub>2</sub>H<sub>5</sub>), CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>, (CH<sub>3</sub>)<sub>2</sub>-CH and (CH<sub>3</sub>)<sub>3</sub>-C groups, corresponding to R<sub>7</sub> in the monomer unit represented by formulae [7] and [8].

17. The method for producing a structure according to claim 16, wherein the monomer unit of

polyhydroxyalkanoate coating the base material is oxidized into a monomer unit of different species.

18. The method for producing a structure according to claim 17, wherein the monomer unit to be oxidized is represented by the formula [2] with R2 of vinyl group, and the monomer unit of different species is represented by the formula [2] with R2 of epoxy group or COOR21 (R21 is H, Na or K atom).

19. The method for producing a structure according to claim 17, wherein the monomer unit to be oxidized is represented by the formula [16], and the monomer unit of different species is represented by one of the formulae [7] and [8]:



15. (wherein, "g" is an integer of 1 to 8; and R7 is H or halogen atom, or CN, NO<sub>2</sub>, COOR71 (R71 is H, Na, K, CH<sub>3</sub> or C<sub>2</sub>H<sub>5</sub>), SO<sub>2</sub>R72 (R72 is OH, ONa, OK, a halogen atom, OCH<sub>3</sub> or OC<sub>2</sub>H<sub>5</sub>), CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, C<sub>3</sub>H<sub>7</sub>, (CH<sub>3</sub>)<sub>2</sub>-CH or (CH<sub>3</sub>)<sub>3</sub>-C group, which are independently applicable to each

unit when there are 2 or more units).

20. The method for producing a structure according to one of claims 16 to 19, further comprising the step of chemically modifying, at least  
5 partly, the polyhydroxyalkanoate coating the base material.

21. The method for producing a structure according to claim 20, wherein the chemical  
modification step reacts at least part of the  
10 polyhydroxyalkanoate with a compound having a reactive functional group at the terminal to add a graft chain to at least part of the polyhydroxyalkanoate.

22. The method for producing a structure  
15 according to one of claims 16 to 19, wherein composition of the 3-hydroxyacyl coenzyme A is varied with time to vary the monomer unit composition in the polyhydroxyalkanoate from the inside towards the outside of the structure.

20 23. A method for producing a toner comprising the step of producing the particulate structure according to one of claims 16 to 19.